



PHENIX PC Operation in the PEH

PHENIX Procedure No. PP-2.5.2.5-04

Revision: D

Date: 6/4/2013

Hand Processed Changes

HPC No.

Date

Page Nos.

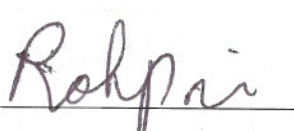
Initials

- *Mismatched & Outdated: Reference 8.3 has incorrect title and the revision is outdated. BNL Occupational Health & Safety Guide (Interim), Section 4.11.0, "Installation of Flammable Gas Systems (Experimental & Temporary Installations)" June 21, 1989. The current revision is July 16, 2010, Rev 3.2. It should be written as BNL SBMS, ESH Standards, Section 4.11.0 "Installation of Flammable Gas Systems (Experimental & Temporary Installations)"*
- *Typo: Both Section 5.1.5 & Section 9 refer to Attachment 4, yet the actual attachments are 4.2 & 4.3.*

Approvals

 6/5/13

PHENIX S E & I Date

 6/3/13

Cognizant Scientist

Date

 6-6-13

PHENIX Safety Date

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PHENIX Safety	Date		

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	TYPED BY
A	First Issue	4/28/2000	n/a	J. Haggerty, M. Sivertz, W. Lenz, Y. Makdisi	n/a
B	No apparent change from rev. A. No reason determined for revision.	5/15/2000	n/a	No Record of Approval found	n/a
C	Revised to remove references to gas system procedures. These are now in PP 2.5.2.4-04. Specifically deleted sections 1.1, 2.1 2.5, 3.2, 4.1, 6.1, 6.2, 6.3, 8.2, 8.4, 8.5, 8.6, and sec. 6 introductory paragraph, sec. 7 reference to gas system removed. Attachments 1, 5 and 6 deleted. All sections renumbered to fill removed slots.	6/24/2010	R. Pisani	R.Pisani, D. Lynch, P. Giannotti	P. Giannotti
D	3 year review with no changes to content. New rev letter and date	6/4/2013	R. Pisani	R.Pisani, D. Lynch, P. Giannotti	P. Giannotti

1. Purpose

The purpose of this document is to specify the operation of the High Voltage (HV) and Low Voltage (LV) Systems for the PHENIX Pad Chambers

This document describes:

1.1 HV Procedures:

1.1.1 Turning on the high voltage to the Pad Chambers, Sec. 6.4

1.1.2 Turning off the HV, Sec. 6.5

1.2 LV Procedures:

1.2.1 Turning on the low voltage for the Pad Chambers, Sec. 6.6

1.2.2 Turning off the LV, Sec. 6.7

2. Responsibilities

During any data taking period there will be at least four people on shift in the PHENIX counting house. Prior to data taking, there will be a period of chamber commissioning when the chambers are flushed with operating gas and tested at high voltage. After the introduction of flammable gas to the Pad Chambers (or any other subsystem) there shall be at least two people on shift at all times.

High Voltage (HV) and Low Voltage (LV) power shall not be left operating unattended.

During commissioning, it will be the responsibility of the Gas Experts to establish the flow of operating gas, as described in Sec. 6.1. During this period there can be no high voltage on the Pad Chambers. It is the responsibility of the Pad Chamber Gas Experts to ensure that the HV is off during this period.

During data taking, it will be the responsibility of the PHENIX Shift Crew to:

2.1 Monitor the status and alarms of the HV system throughout the shift, according to a prescribed checklist (Attachment 2).

2.2 Monitor the status and alarms of the LV system throughout the shift, according to a prescribed checklist (Attachment 3).

2.3 In the event of an alarm or irregularity, contact an expert from the Expert Call List (Attachment 4).

2.4 maintain the Pad Chamber HV System in a safe operating condition. This includes

2.4.1 verifying the readiness of the chamber for HV,

- 2.4.2 turning on the HV according to the operating procedures described below,
 - 2.4.3 posting any special instructions or notifications as required, and
 - 2.4.4 carrying out any emergency actions, as prescribed in the Procedures section of this document.
- 2.5 *maintain the Pad Chamber Low Voltage System in a safe operating condition. This includes:*
- 2.5.1 Verifying the readiness of the chamber for low voltage power
 - 2.5.2 Turning on the LV according to the operating procedures described below,
 - 2.5.3 Posting any special instructions or notifications as required, and
 - 2.5.4 carrying out any emergency actions, as prescribed in the Procedures section of this document.

3. Prerequisites

The Pad Chamber Experts shall have read or have training in the following areas:

- 3.1 C-A Local Emergency Plan for the Collider-Accelerator Department, C-A_3.0,
- 3.2 BNL Compressed PHENIX Emergency Plan C-A_3.16
- 3.3 geographical layout of the experimental area (routes of egress, location of emergency equipment, phones and controls)

4. Precautions

The PHENIX Safety Monitoring and Control System (SMCS) is interlocked with the power to the Gas Room of the Mixing House (MH). In the event of any Level 3 alarm, all power to the Gas Room of the MH is shut off.

The Level 3 alarms include:

- Detection of flammable gas by the VESDA system in the Interaction Region (IR),
- Detection of smoke by the HSSD system in the IR.
- Flammable gas alarms in the MH.
- Heat sensor alarms in the MH.

4.1 High Voltage System Precautions:

- 4.1.1 The SMCS is interlocked with the High Voltage (HV) power supplies. Activation of the alarms automatically shuts down the power to all HV supplies,
- 4.1.2 The total stored electrical energy in the high voltage systems is low. The HV power supplies are current limited at less than 10 microamps per channel. All HV points are covered by an insulating layer in order to eliminate the danger to personnel. When the Pad Chambers are mounted on the carriage the HV points are inaccessible to personnel
- 4.1.3 Before any HV can be turned on, sufficient gas must have flowed through each of the detectors to remove oxygen from the chambers. This will be accomplished by purging the chambers with inert gas prior to the introduction of flammable gas. The gas flow rate is 0.1 liter per minute (LPM), and the largest chamber has a gas volume of 48 liters. Thus it will take 8 hours for a single exchange of gas, or 24 hours for 3 volume exchanges. So flammable gas shall not be introduced into the chambers until they have been purged with inert gas for at least 24 hours. This ensures that there will not be a flammable mixture in the chambers or gas system.
- 4.1.4 For the safety of the chambers, HV will not be turned on, except for low voltage testing, until operating gas has filled the chamber. Voltages less than 700 volts may be applied to the chambers for short periods of time provided the operation is monitored at all times by a Pad Chamber expert. In order to raise the HV to operating voltage, the chamber must be filled with operating gas. This means that operating gas must be flowing for at least 24 hours prior to increasing the HV above 700 volts.
- 4.1.5 All HV controls associated with the PC HV system are to be operated by designated PC HV experts only, or by the PHENIX shift leader following specific instructions from PC experts (see Attachment 4)..

4.2 Low Voltage System Precautions:

- 4.2.1 The SMCS is interlocked with the Low Voltage (LV) power supplies. Activation of the alarms automatically shuts down the power to all LV supplies. The LV system is used to provide power to the Pad Chamber Front End Modules (FEMs) which are monitored by 36 temperature probes. Overtemperature indication on a thermocouple will shut off power to that module.
- 4.2.2 Any reconfiguration of the PC LV beyond turning the power on/off is to be performed by PC LV experts only, or by the PHENIX shift leader following specific instructions from PC experts (see Attachment 4).

5 Emergency Procedures

In the event of an emergency, follow the procedures outlined in PHENIX Emergency Procedure 3.16 detailed below.

5.1 *In the event of a fire or fire alarm in Building 1008, members of the PHENIX Shift Crew shall (in order of priority)*

- 5.1.1 Pull the nearest fire alarm if the alarm is not already sounding (Attachment 1 gives the layout of the building 1008 showing the location of the gas system area and the fire alarm pull stations in the area),
- 5.1.2 Go to a safe location and call 911 or 2222.

5.1.3 Await the arrival of the Fire/Rescue Group. If the fire is small, the Shift Crewmember may return to the area and attempt to extinguish the fire using a fire extinguisher.

5.1.4 The Shift Leader shall report to the Fire/Rescue Captain upon arrival at the Command Post.

5.2 *In the event of an emergency related specifically to the Pad Chamber gas or electronics,*

5.2.1 The SMCS is interlocked with the Gas, HV and LV power supplies. Activation of the alarm automatically shuts down the flammable gas flow and all power to HV and LV supplies. No further action is needed for this.

5.2.2 Notify the Pad Chamber Expert On Call that an emergency affecting the Pad Chambers has occurred

6 Standard Operating Procedures

6.1 *HV System Procedures: Turning on HV:*

If the HV is being turned on the first time, verify by checking with a Pad Chamber Gas Expert that operating gas has been flowing to the Pad Chambers for at least 24 hours before attempting to bring on the HV.

6.1.1 Check that the appropriate current limits are in place for the power supply. These limits are given in Attachment 2. The Pad Chamber Experts shall maintain a HV logbook where the operating parameters of the HV settings are recorded. This shall include the current limits, target voltages, ramp rates, operating voltages and currents, and trip tolerances.

6.1.2 Check that the target voltage for each HV output line is appropriate (50 volts). The first stage of bringing on the HV shall be a single increment in the ramp up. This is because the current trips are disabled during ramping, and in order to locate a short in the system, it is necessary to halt the ramping and check the current at the earliest possible stage.

6.1.3 Check that the ramp up rate for each HV supply is appropriate (50 volts per step).

6.1.4 Begin ramping up the HV.

6.1.5 If any of the HV supplies trips, disable all HV supplies for that chamber until the reason for the trip is understood. Then begin the procedure again from 6.5.1

6.1.6 If there are no HV trips, verify that the operating currents are appropriate.

6.1.7 Change the target voltage to the correct operating voltage for each chamber, as given in Attachment 2.

6.1.8 Continue ramping up the HV.

6.1.9 When ramping is complete, verify that the operating currents are appropriate, as given in Attachment 2.

6.1.10 HV is ready for chamber testing.

6.2 *HV System Procedures: Turning off High Voltage to a chamber:*

6.2.1 Begin ramping down the HV.

6.2.2 Verify by the read back that the HV is off the system.

6.2.3 In the event of irregularities, call a Pad Chamber Expert.

6.3 *LV System Procedures: Turning on Low Voltage:*

6.3.1 Verify that the AC is on to the LV crate.

6.3.2 Click on the appropriate button to turn LV power on to the channel required.

6.3.3 Verify that the button changes color to indicate power is on (RED). This may take ten to twenty seconds. If not, call a Pad Chamber Expert.

6.3.4 Verify that the temperature monitors are within tolerance by checking Attachment 3. If not, call a Pad Chamber Expert.

6.4 *LV System Procedures: Turning off Low Voltage:*

6.4.1 Click on the appropriate button to turn LV power off to the channel required.

6.4.2 Verify that the button changes color to indicate power is off (GREEN). This may take ten to twenty seconds. If not, call a Pad Chamber Expert.

7 Documentation

The Pad Chambers shall maintain a separate logbook for the HV Status, and LV Status

8 References

8.1 C-A_3.0, "Local Emergency Plan for the Collider-Accelerator Department."

8.2 BNL Occupational Health and Safety Guide (Interim), Section 4.11.0, "Installation of Flammable Gas Systems (Experimental & Temporary Installations)", June 21, 1989.

9 Appendix A

- 9.1 Attachment 2: - Check list for the Pad Chamber High Voltage System
- 9.2 Attachment 3: - Check list for the Pad Chamber Low Voltage System
- 9.3 Attachment 4: - Call list for the HV, and LV Experts.

Attachment 2: PC HV Settings

Each PC chamber has 4 separate channels of HV.

The nominal voltages and currents for each **PC-1** chamber are:

Anode voltage	+1600V
Current trip setting/channel	10 microamps
Bulk supply trip setting	100 microamps
Ramping voltage steps	50 Volts per step

The nominal voltages and currents for each **PC-3** chamber are:

Anode voltage	+1800V
Current trip setting/channel	10 microamps
Bulk supply trip setting	100 microamps
Ramping voltage steps	50 Volts per step

NB: These voltages and trip settings are subject to change as we learn about the chamber operation. Please refer to the PC HV Logbook for additional information on the HV settings.

Attachment 3: PC LV Settings

Each PC chamber has 2 separate channels of Low Voltage (LV).

The nominal voltages and currents for each Pad Chamber are:

7.5 volts

7.0 volts

7.0 volts.

All thermocouple readings should be nominal (See Pad Chamber Low Voltage LogBook. **Attachment 4.2: PC High Voltage System Experts**

The following people have been trained to operate the PHENIX PC HV system. They have completed the prerequisite BNL training courses (see 3.1).

Michael Sivertz	x6102 (office)	631-878-9020 (home)
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Karim El Chenawi	x6102 (office)	631-821-6094 (home)
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Additional qualified users are to be listed below and posted in the counting house:

Attachment 4.3: PC Low Voltage System Experts

The following people have been trained to operate the PHENIX PC LV system. They have completed the prerequisite BNL training courses (see 3.1).

Michael Sivertz	x6102 (office)	631-878-9020 (home)
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Karim El Chenawi	x6102 (office)	631-821-6094 (home)
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Additional qualified users are to be listed below and posted in the counting house: